Remarks

Applicants have received and carefully reviewed the Office Action mailed May 16, 2006. Claims 1-9 remain pending. Reconsideration and reexamination are respectfully requested.

Rejection under 35 U.S.C. § 103(a)

Claims 1-9 remain rejected as being unpatentable over Wise et al. (US 6,838,640), Rounbehler et al. (US 5,300,758), and Philips et al. (US 5,196,039). Applicants respectfully traverse the rejection. The Examiner states, in the Response to Arguments section, that the test for obviousness is what the combined teachings of the references would have suggested to those of ordinary skill in the art. Applicants submit that the teachings of Wise et al., Rounbehler et al. and Philips et al. would not have suggested their combination to one of ordinary skill in the art.

Wise et al. teach a miniaturized micro-gas chromatograph having a pre-concentrator, filtered inlet, calibration source and polar/non-polar columns etched into a silicon substrate. Wise et al. teach the miniaturized structure as either a stack of silicon-glass substrates, such as DRIE, or chemical-vapor-deposited (CVD) film on the channels, and that "[i]n either case, the structure would be vacuum sealed to minimize heat losses from the column and thermally isolate it as much as possible." See column 6, lines 38-44. Wise et al. teach their device as "a low-power, battery-operated, temperature-programmed fast μGC." See column 5, lines 33-34. Wise et al. thus appears to teach a miniature, compact, sealed device in which a series of channels provide multi-zone temperature control for various reactions. Rounbehler et al. teach a system including first and second gas chromatographs, first and second prolyzers, and two series-connected vapor concentrators positioned ahead of the first gas chromatograph. See column 2, lines 7-12 and 28-31. Rounbehler et al. specifically teach:

> a preferred vapor concentration unit 32 comprises two vapor concentrators VC1 38 and VC2 40 connected by a flow line 44 in which a valve 46 is provided. Each of the vapor concentrators VC1 38 and VC2 40 is connected to a carrier gas supply 48 which supplies to the concentrators a gas such as hydrogen.

See column 4, lines 29-35. Rounbehler et al. also teach the two vapor concentrators as capillary tubes each encased in a metal tube whose outer surface is in thermal contact with a cooled mass that

> normally maintains the metal tube, and hence inner capillary tube, of the vapor concentrator 38 or 40 at or below room temperature (e.g., at a temperature such as about 10C.) so that the GC coating will trap vapors from gas samples directed through the capillary tube. The outer metal tube is also connected to a source of electric power for controlled, very rapid resistance heating of the metal tube- for example, from about 10C. to 250C. in about one second. This very rapid heating, preferably accomplished automatically under programmed control...is continually monitored and employed as a feedback parameter in controlling the power applied to the tube

Emphasis added; see column 4, line 66 through column 5, line 11. Rounbehler et al. thus appear to teach a device in which sufficient power is needed to achieve very rapid heating of the gas in order to concentrate the vapors. In contrast, Wise et al. appear to teach a low-power, battery-operated device that needs only 45 mW to "achieve a temperature rise of 100 C in 200 sec." rather than the 450 mW needed by an anodically-bonded column. Emphasis added; see column 5, lines 26-29. The device of Rounbehler et al. thus appears to require a stronger power source for very rapid heating for the concentrators as opposed to the low-power, slower heating device of Wise et al. Applicants submit that in view of the significantly faster heating required for the concentrators of Rounbehler et al., one of ordinary skill in the art would not be motivated to add a concentrator as taught by Rounbehler et al. to the low-power, battery-operated device taught by Wise et al.

Further, even if one were to attempt such a combination, it is not clear how the teachings would be combined. In particular, it is not clear how the very rapid heating that appears to be required in the concentrators of Rounbehler et al. would be incorporated into the low-power, battery-operated, low thermal mass structure of Wise et al. The Examiner asserts that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference, rather the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. The Examiner also asserts

that one of ordinary skill in the art would be able to employ the teachings/methods of the prior art in any type of device, miniature/micro or otherwise. The Examiner has not, however, provided any indication of how the complex heating and concentrating elements of Rounbehler et al. could be achieved or incorporated into the low-power micro device of Wise et al.

The Examiner asserts that "one of ordinary skill in the art would clearly be motivated to employ the specific teachings of the Prior Art references and make the proper combination as a result of their teachings and disclosures." Applicants respectfully submit that such statements do not provide any indication as to why one would desire to combine the teachings of Wise et al. and Rounbehler et al. The motivation provided by the Examiner for combining Wise et al. and Rounbehler et al. is "providing means to permit rapid concentration of vapors", pointing to column 2, lines 28-31 of Rounbehler et al. However, Wise et al. teach their device as including a multi-stage pre-concentrator 28, thus it appears concentration of vapors is already provided for in the Wise et al. device. It is not clear how adding additional concentrators to the Wise et al. device would provide means to permit rapid concentration of vapors over the means already provided by the pre-concentrator taught by Wise et al. It would appear that making the Examiner's asserted modification to the Wise et al. device would result in a duplicated structure. Applicants submit that there is no motivation in the cited references, common knowledge or common sense of a person of ordinary skill in the art to add the concentrators of Rounbehler et al. to the device of Wise et al. that already has a multi-stage pre-concentrator.

Additionally, Applicants submit that even if one were to combine the teachings of Wise et al., Rounbehler et al., and Philips et al., there is no reasonable expectation of success in making such a combination. As stated above, Wise et al. teach a low-power, battery-operated device that achieves an increase in temperature of 100C in 200 seconds, whereas Rounbehler et al. teach a device that appears to require an increase in temperature from 10C to 250C in one second. It is not clear how concentrators such as those disclosed by Rounbehler et al., apparently requiring very rapid heating, would be incorporated into a device such as that disclosed by Wise et al. The Examiner asserts that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference, but

rather what the references would have suggested to one of ordinary skill in the art. Applicants submit that the Wise et al. and Rounbehler et al. references appear to teach significantly different heating and timing requirements, and that one of ordinary skill in the art, upon reading both Wise et al. and Rounbehler et al., would have no motivation or reasonable expectation of success in attempting to combine the teachings. It would appear that, in order to incorporate the overall teaching of Rounbehler et al. of using concentrators for the Examiner's asserted advantage of permitting rapid concentration of vapors, would require the very rapid heating disclosed by Rounbehler et al. As Wise et al. already teach a multi-stage pre-concentrator 28 in a device that is low-power and battery-operated, there does not appear to be any expectation of success in modifying such a low-power, battery-operated device to achieve the very rapid heating apparently required by the concentrators of Rounbehler et al. Further, there does not appear to be any reasonable expectation of success in adding concentrators that appear to require very rapid heating, such as those disclosed by Rounbehler et al., to the device of Wise et al. that already includes a multi-stage pre-concentrator.

The Examiner also asserts that it would have been obvious to one of ordinary skill in the art to modify the individual heating elements taught by Wise et al. and use instead the heater of Philips et al. within the channels of the pre-concentrator of Wise et al. to provide thermal modulation to accumulate and focus, refocus and then accelerate a concentration pulse in the carrier stream without the loss of orthogonality. Applicants respectfully disagree. Philips et al. teach a two-dimensional chromatography system in which thermal modulation is used to focus, refocus and accelerate a concentration pulse through two dimensions to separate chemical components of a sample. See column 4, lines 38-59. The methodologies and systems of Wise et al. and Philips et al. are vastly different and Applicants submit that there is no motivation for combining their teachings. Additionally, it is not clear how one of ordinary skill in the art would accomplish such a combination. Philips et al. teach a device in which the outlet of a first column is connected to the inlet of a second column. The thermal modulator is taught as being connected between the outlet of the sample injection device and the inlet of the first column or between the outlet of the first column and the inlet of the second column. See column 5, line 43

through column 6, line 5. It is not clear how the thermal modulator of Philips et al. would be connected to the micro-gas chromatograph of Wise et al. Applicants submit that there is no motivation to combine the teachings of Wise et al. with either Rounbehler et al. or Philips et al., and that even if one were to make such a combination, the resulting device would not appear to operate as taught by Wise et al. Additionally, such a combination would not result in the device presently claimed. Reconsideration and withdrawal of the rejection are respectfully requested.

Reconsideration and reexamination are respectfully requested. It is submitted that, in light of the above remarks, all pending claims 1-9 are now in condition for allowance. If a telephone interview would be of assistance, please contact the undersigned attorney at 612-677-9050.

Respectfully submitted,

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